

## STATISTICAL BRIEF #259

June 2020

### Characteristics and Costs of Potentially Preventable Inpatient Stays, 2017

*Kimberly W. McDermott, Ph.D., and H. Joanna Jiang, Ph.D.*

#### Introduction

Hospital care represents the largest component of U.S. healthcare expenditures.<sup>1</sup> As a result, reducing potentially preventable hospitalizations has become a priority among policymakers and public and private payers.<sup>2</sup> Potentially preventable hospitalizations are inpatient stays for treating ambulatory care-sensitive conditions (ACSCs) that evidence suggests may be avoidable, in part, through timely and quality primary and preventive care.<sup>3</sup> Examples of ACSCs include complications of diabetes and asthma. High hospital admission rates for these conditions may indicate areas where changes to the healthcare delivery system could be implemented to improve patient outcomes and lower costs. Determining the volume and costs of potentially preventable inpatient stays can identify where potential cost savings might be found associated with reducing these hospitalizations overall and among specific subpopulations.

This Healthcare Cost and Utilization Project (HCUP) Statistical Brief presents weighted national estimates of potentially preventable inpatient stays using the State Inpatient Databases (SID) from 36 States. Potentially preventable stays were defined using the Agency for Healthcare Research and Quality (AHRQ) Prevention Quality Indicators (PQIs)<sup>4</sup> and Pediatric Quality Indicators (PDIs).<sup>5</sup> The PQIs and area-level PDIs were developed to identify hospitalizations for ACSCs.

This Statistical Brief presents statistics on potentially preventable inpatient stays separately for adults and children. Obstetric stays and neonatal stays are excluded. The total number of adult and pediatric potentially preventable stays and associated aggregate costs are presented for chronic and acute conditions. For adults, age-sex-adjusted rates are presented by patient characteristics

#### Highlights

- In 2017, 3.5 million potentially preventable adult inpatient stays accounted for \$33.7 billion in aggregate hospital costs. These stays represented 12.9 percent of all nonobstetric stays and 8.9 percent of costs for all nonobstetric stays.
- Of the 1,358,900 nonobstetric pediatric stays in 2017, 108,300 (8.0 percent) were potentially preventable. These preventable stays cost \$561.6 million, or 2.8 percent of the \$20.0 billion in aggregate hospital costs for all pediatric stays.
- The most common and most expensive reason for potentially preventable stays was heart failure for adults (1,112,600 stays and \$11.2 billion in aggregate hospital costs) and asthma for children (53,900 stays and \$278.1 million in aggregate costs).
- In 2017, the rate of potentially preventable adult stays increased with age and decreased with community-level income.
- Potentially preventable stays with a primary expected payer of Medicare accounted for 65.4 percent of potentially preventable adult stays and 65.9 percent of hospital costs associated with these stays.

<sup>1</sup> Centers for Medicare & Medicaid Services. NHE Fact Sheet. Updated December 5, 2019. [www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NHE-Fact-Sheet). Accessed March 1, 2020.

<sup>2</sup> Brennan N, Engelhardt T. Data Brief: Sharp Reduction in Avoidable Hospitalizations Among Long-Term Care Facility Residents. CMS.gov Blog. January 17, 2017. Centers for Medicare & Medicaid Services. [www.cms.gov/blog/data-brief-sharp-reduction-avoidable-hospitalizations-among-long-term-care-facility-residents](http://www.cms.gov/blog/data-brief-sharp-reduction-avoidable-hospitalizations-among-long-term-care-facility-residents). Accessed March 2, 2020.

<sup>3</sup> Agency for Healthcare Research and Quality. AHRQ Quality Indicators: Prevention Quality Indicators Overview. [www.qualityindicators.ahrq.gov/modules/pqi\\_overview.aspx](http://www.qualityindicators.ahrq.gov/modules/pqi_overview.aspx). Accessed March 2, 2020.

<sup>4</sup> Agency for Healthcare Research and Quality. Prevention Quality Indicators Overview. [www.qualityindicators.ahrq.gov/Modules/pqi\\_resources.aspx](http://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx). Accessed May 5, 2020.

<sup>5</sup> Agency for Healthcare Research and Quality. Pediatric Quality Indicators Overview. [www.qualityindicators.ahrq.gov/Modules/pdi\\_resources.aspx](http://www.qualityindicators.ahrq.gov/Modules/pdi_resources.aspx). Accessed May 5, 2020.

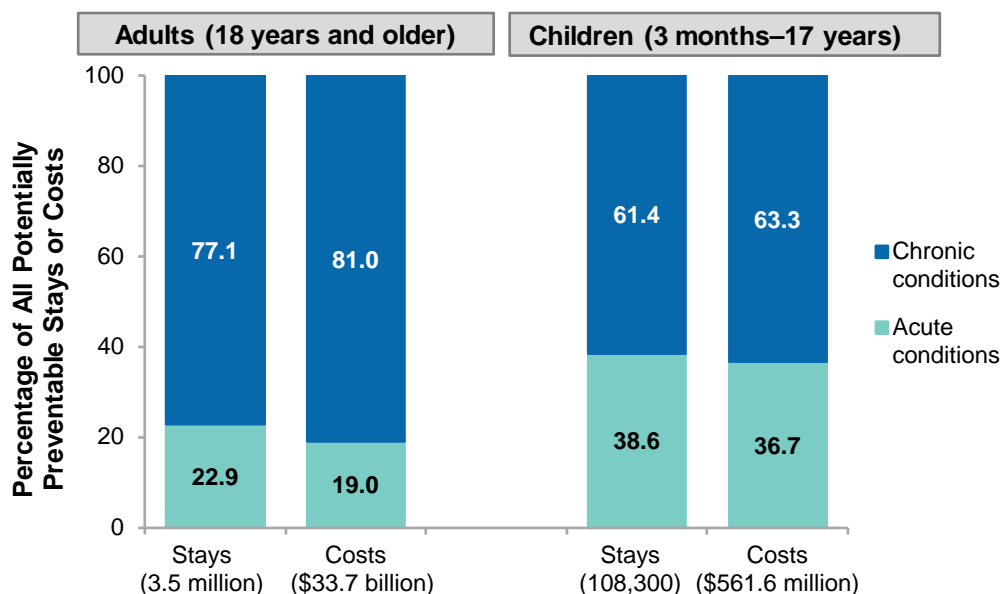
and hospital census region for all conditions, chronic conditions only, and acute conditions only. The number of inpatient stays, aggregate costs, and mean cost per stay are presented for each condition category as well as for individual conditions. Additionally, volume and cost statistics are presented by primary expected payer. For children, age-sex-adjusted rates, as well as volume and cost statistics for four individual pediatric conditions are provided. Because of the large sample size of the SID data, small differences can be statistically significant. Thus, only percentage differences greater than or equal to 10 percent are discussed in the text.

## Findings

### *Potentially preventable adult and pediatric inpatient stays, 2017*

Figure 1 presents the total number of nonobstetric adult (patients aged 18 years and older) and pediatric (patients aged 3 months to 17 years) stays and related aggregate hospital costs in 2017 that were potentially preventable. Among adults, chronic conditions include four diabetes-specific conditions<sup>6</sup> as well as chronic respiratory diseases (chronic obstructive pulmonary disease and asthma in younger adults) and circulatory diseases (hypertension and heart failure). Acute conditions include community-acquired pneumonia and urinary tract infection.<sup>7</sup> Among children, chronic conditions include asthma and diabetes short-term complications. Acute conditions include gastroenteritis and urinary tract infection.

**Figure 1. Potentially preventable stays and related costs for chronic and acute conditions, 2017**



Note: Consistent with the Agency for Healthcare Research and Quality Prevention Quality Indicators and Pediatric Quality Indicators, obstetric stays are excluded.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **In 2017, 3.5 million potentially preventable adult inpatient stays accounted for \$33.7 billion in aggregate costs.**

There were 3.5 million inpatient stays among adults aged 18 years and older that were potentially preventable. This represented 12.9 percent of the 27.4 million nonobstetric adult inpatient stays that year (data not shown). The hospital costs associated with potentially preventable adult stays totaled \$33.7 billion, or 8.9 percent of the \$380.1 billion in aggregate hospital costs for all stays (data not shown).

<sup>6</sup> Diabetes-related conditions include diabetes short-term complications, diabetes long-term complications, lower-extremity amputation among patients with diabetes, and uncontrolled diabetes.

<sup>7</sup> Although all other adult PQI conditions were defined using principal diagnosis, lower-extremity amputation among patients with diabetes (a chronic condition) was defined using all-listed diagnoses. As such, it was possible for a single visit to be included in both the chronic condition and acute condition totals. This was extremely rare (i.e., fewer than 30 cases) and, as such, did not affect the rounded totals or percentages presented.

- **In 2017, 108,300 potentially preventable pediatric inpatient stays totaled \$561.6 million in aggregate costs.**

Of the 1,358,900 pediatric inpatient stays among children aged 3 months to 17 years (data not shown), 8.0 percent (108,300) were potentially preventable. These preventable stays amounted to \$561.6 million, or 2.8 percent of the \$20.0 billion in aggregate hospital costs for all nonobstetric pediatric stays (data not shown).

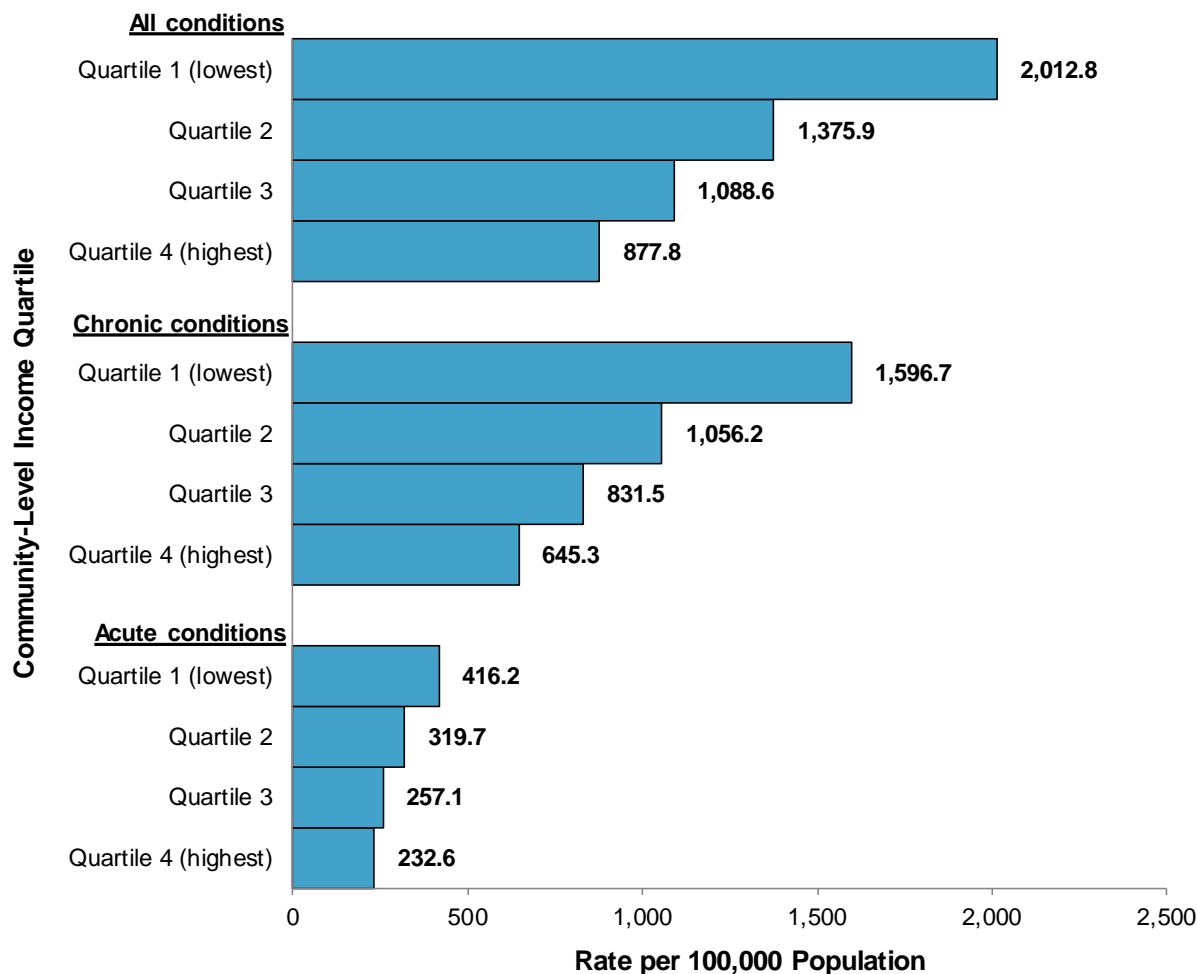
- **The majority of potentially preventable stays and associated costs were for chronic conditions.**

In 2017, chronic conditions accounted for 77.1 percent (2.7 million) of potentially preventable adult stays and 61.4 percent (66,500) of potentially preventable pediatric stays. Stays for chronic conditions represented 81.0 percent (\$27.3 billion) and 63.3 percent (\$355.6 million) of hospital costs associated with potentially preventable adult and pediatric stays, respectively.

*Characteristics, volume, and costs of potentially preventable inpatient stays among adults, 2017*

Figure 2 presents the 2017 age-sex-adjusted population rate of potentially preventable inpatient stays among adults for all conditions and for chronic and acute conditions separately by community-level income quartile.

**Figure 2. Rate of potentially preventable adult inpatient stays, by community-level income, 2017**



Notes: Rates are adjusted for age and sex. Consistent with the Agency for Healthcare Research and Quality Prevention Quality Indicators, obstetric stays are excluded.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **Across all conditions, the rate of potentially preventable adult inpatient stays decreased with community-level income.**

In 2017, the rate of potentially preventable stays among patients from the lowest income communities (quartile 1) was more than twice as high as the rate among patients from the highest income communities (quartile 4) for all conditions (2,012.8 vs. 877.8 per 100,000 population) and for chronic conditions (1,596.7 vs. 645.3 per 100,000 population). The rate was nearly 1.8 times as high for acute conditions (416.2 vs. 232.6 per 100,000 population).

Table 1 presents the 2017 age-sex-adjusted population rate of potentially preventable inpatient stays among adults aged 18 years and older for all conditions and for chronic and acute conditions separately, overall and by patient and hospital characteristics.

**Table 1. Rate of potentially preventable adult inpatient stays, by patient characteristics and hospital census region, 2017**

| Patient or hospital characteristic | Rate per 100,000 population |                    |                  |
|------------------------------------|-----------------------------|--------------------|------------------|
|                                    | All conditions              | Chronic conditions | Acute conditions |
| Overall                            | 1,328.4                     | 1,023.0            | 305.4            |
| Age group, years                   |                             |                    |                  |
| 18–44                              | 328.8                       | 253.1              | 75.7             |
| 45–64                              | 1,261.0                     | 1,060.1            | 200.9            |
| 65+                                | 4,142.8                     | 3,055.9            | 1,086.9          |
| Sex                                |                             |                    |                  |
| Male                               | 1,369.0                     | 1,111.7            | 257.3            |
| Female                             | 1,300.0                     | 953.8              | 346.1            |
| Race/ethnicity                     |                             |                    |                  |
| Asian/Pacific Islander             | 580.9                       | 439.2              | 141.8            |
| Black                              | 2,572.5                     | 2,198.0            | 374.5            |
| Hispanic                           | 1,314.8                     | 992.0              | 322.8            |
| White                              | 1,173.2                     | 874.6              | 298.5            |
| Other                              | 4,910.5                     | 3,718.9            | 1,191.6          |
| Location of patient's residence    |                             |                    |                  |
| Large central metropolitan         | 1,373.4                     | 1,094.4            | 279.0            |
| Large fringe metropolitan          | 1,327.4                     | 1,016.7            | 310.6            |
| Medium metropolitan                | 1,193.6                     | 930.4              | 263.3            |
| Small metropolitan                 | 1,223.1                     | 948.0              | 275.1            |
| Micropolitan area                  | 1,427.8                     | 1,061.5            | 366.3            |
| Noncore rural area                 | 1,596.2                     | 1,107.0            | 489.2            |
| Hospital region                    |                             |                    |                  |
| Northeast                          | 1,344.3                     | 1,041.7            | 302.6            |
| Midwest                            | 1,397.5                     | 1,072.0            | 325.6            |
| South                              | 1,520.3                     | 1,168.5            | 351.8            |
| West                               | 927.8                       | 716.3              | 211.4            |

Notes: Rates are adjusted for age and sex. Consistent with the Agency for Healthcare Research and Quality Prevention Quality Indicators, obstetric stays are excluded.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **Across conditions, the rate of potentially preventable adult inpatient stays was highest among patients aged 65 years and older and Black patients, and the rate was lowest among Asian/Pacific Islander patients and patients treated at hospitals in the West.**

In 2017, for all conditions, chronic conditions, and acute conditions, the rate of potentially preventable stays increased with age. The rate for all conditions among adults aged 65 years and older was more than 12 times greater than the rate for those aged 18–44 years (4,142.8 vs. 328.8 per 100,000 population).

Among specific individual racial/ethnic groups (i.e., excluding the Other category), the rate of potentially preventable stays was highest among Black patients (2,572.5 per 100,000 population for all conditions) and lowest among Asian/Pacific Islander patients (580.9). This was true for both chronic and acute conditions.

For all conditions, chronic conditions, and acute conditions, the rate of potentially preventable stays was lower in the West (e.g., 927.8 per 100,000 population for all conditions) compared with other regions (which ranged from 1,344.3–1,520.3 per 100,000 for all conditions).

- **In 2017, the rate of potentially preventable adult stays for acute conditions was higher among females than among males. For chronic conditions, the rate was higher among males.**

Compared with males, the rate of potentially preventable stays among female adults was higher for acute conditions (346.1 vs. 257.3), lower for chronic conditions (953.8 vs. 1,111.7), and similar overall.

Table 2 presents the total number of stays, aggregate costs, and mean cost per stay of potentially preventable inpatient stays among adults aged 18 years and older for all conditions, chronic conditions, and acute conditions, as well as for individual chronic and acute conditions in 2017.

**Table 2. Total stays, aggregate costs, and mean cost per stay for potentially preventable adult inpatient stays, 2017**

| Potentially preventable inpatient stays                 | Total stays, N | Aggregate costs, \$ billions | Mean cost per stay, \$ |
|---|----------------|------------------------------|------------------------|
| All conditions  | 3,530,900      | 33.685                       | 9,500                  |
| Chronic conditions                                      | 2,720,800      | 27.261                       | 10,000                 |
| Heart failure   | 1,112,600      | 11.240                       | 10,100                 |
| Chronic obstructive pulmonary disease                   | 825,800        | 7.273                        | 8,800                  |
| Diabetes <sup>a</sup>                                   | 590,800        | 7.365                        | 12,500                 |
| Diabetes long-term complications                        | 281,200        | 4.304                        | 15,300                 |
| Diabetes short-term complications                       | 157,700        | 1.167                        | 7,400                  |
| Uncontrolled diabetes                                   | 116,200        | 0.775                        | 6,700                  |
| Lower-extremity amputation among patients with diabetes | 78,200         | 2.110                        | 27,000                 |
| Hypertension  | 160,600        | 1.194                        | 7,400                  |
| Asthma in younger adults                                | 31,300         | 0.195                        | 6,200                  |
| Acute conditions  | 810,100        | 6.414                        | 7,900                  |
| Community-acquired pneumonia                            | 429,500        | 3.862                        | 9,000                  |
| Urinary tract infection                                 | 380,600        | 2.550                        | 6,700                  |

Notes: Number of stays and mean costs are rounded to the nearest hundred. Totals and costs for all conditions, chronic conditions (including the overall diabetes total), and acute conditions are based on Prevention Quality Indicator (PQI) composite measures. For these measures, an inpatient stay that meets the criteria for multiple components of the composite (i.e., multiple conditions) is counted only once. Consistent with the Agency for Healthcare Research and Quality PQIs, obstetric stays are excluded.

<sup>a</sup> Unlike the other potentially preventable conditions, lower-extremity amputation among patients with diabetes was not identified by principal diagnosis. Thus, it was possible for an inpatient stay to meet the criteria for this condition and one of the other chronic or acute conditions. In most of these cases, the overlap was with another diabetes condition. Because of this overlap, totals and costs for individual diabetes conditions should not be summed to estimate the diabetes group total or aggregate costs.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **Heart failure, diabetes, and chronic obstructive pulmonary disease (COPD) were the three most common and most expensive reasons for potentially preventable inpatient stays among adults.**

In 2017, heart failure and COPD were the two most common reasons for potentially preventable adult inpatient stays, accounting for 1,112,600 and 825,800 stays, respectively. In terms of aggregate hospital costs, heart failure was the costliest condition (\$11.2 billion) among potentially preventable stays, followed by diabetes (\$7.4 billion) and COPD (\$7.3 billion).

Overall, diabetes accounted for 590,800 potentially preventable adult inpatient stays. Diabetes long-term complications was the most common diabetes diagnosis (281,200 stays) and accounted for the highest total costs (\$4.3 billion) among potentially preventable diabetes stays. Lower-extremity amputation among patients with diabetes was the diagnosis associated with the highest mean cost (\$27,000 per stay) among all potentially preventable adult stays.



Table 3 presents the number of potentially preventable adult inpatient stays and the costs associated with these stays by primary expected payer in 2017. The total number of stays and aggregate costs are also reported as a percentage of all potentially preventable stays and all nonobstetric inpatient stays.

**Table 3. Total stays and aggregate costs of potentially preventable adult inpatient stays, by primary expected payer, 2017**

| Primary expected payer          | Total stays, N | Potentially preventable stays, % | All nonobstetric stays, % | Aggregate costs, \$ billions | Aggregate costs for potentially preventable stays, % | Aggregate costs for all nonobstetric stays, % |
|---------------------------------|----------------|----------------------------------|---------------------------|------------------------------|--|---|
| Adult stays (age 18+ years)     | 3,530,900      | 100.0                            | 12.9                      | 33.685                       | 100.0  | 8.9   |
| Medicare                        | 2,310,000      | 65.4                             | 15.4                      | 22.201                       | 65.9   | 10.7  |
| Medicaid                        | 498,000        | 14.1                             | 12.3                      | 4.912                        | 14.6   | 8.9   |
| Private                         | 503,500        | 14.3                             | 8.0                       | 4.748                        | 14.1   | 5.1   |
| Self-pay/No charge <sup>a</sup> | 153,700        | 4.4                              | 12.2                      | 1.222                        | 3.6  | 8.9   |
| Other payers                    | 65,500         | 1.9                              | 8.6                       | 0.602                        | 1.8  | 5.5   |

Notes: Numbers of stays are rounded to the nearest hundred. Consistent with the AHRQ Prevention Quality Indicators, obstetric-related stays are excluded.

<sup>a</sup> Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **In 2017, adult inpatient stays with an expected payer of Medicare accounted for approximately two-thirds of potentially preventable stays and related costs.**

Potentially preventable stays with a primary expected payer of Medicare accounted for 65.4 percent of potentially preventable stays and 65.9 percent of hospital costs associated with these stays. Stays with an expected payer of Medicaid or private insurance each constituted 14–15 percent of potentially preventable stays and related costs.

- **More than 15 percent of all adult inpatient stays with a primary expected payer of Medicare were potentially preventable.**

Of all stays in 2017 with an expected payer of Medicare, 15.4 percent were potentially preventable. Among stays with other expected payers, smaller percentages were potentially preventable—approximately 12 percent for Medicaid and self-pay/no charge and 8.0 percent for private insurance.

*Characteristics, volume, and costs of potentially preventable inpatient stays among children, 2017*

Table 4 presents the 2017 age-sex-adjusted population rate of potentially preventable inpatient stays among children for four conditions: asthma (ages 2–17 years), diabetes short-term complications (ages 6–17 years), gastroenteritis (ages 3 months–17 years), and urinary tract infection (ages 3 months–17 years). The age ranges included in the rates for each condition are consistent with the AHRQ PDI definitions.

**Table 4. Rate of potentially preventable pediatric inpatient stays, by patient characteristics and hospital census region, 2017**

| Patient or hospital characteristic | Rate per 100,000 population |                                   |                 |                         |
|------------------------------------|-----------------------------|-----------------------------------|-----------------|-------------------------|
|                                    | Asthma                      | Diabetes short-term complications | Gastroenteritis | Urinary tract infection |
| Overall                            | 81.8                        | 25.2                              | 36.4            | 21.1                    |
| Age group, years <sup>a</sup>      |                             |                                   |                 |                         |
| 0–4                                | 159.1                       | n/a                               | 90.1            | 40.9                    |
| 5–9                                | 103.0                       | 11.8                              | 23.8            | 15.5                    |
| 10–14                              | 49.9                        | 27.9                              | 12.5            | 8.7                     |
| 15–17                              | 27.0                        | 37.7                              | 14.7            | 20.5                    |
| Sex                                |                             |                                   |                 |                         |
| Male                               | 96.3                        | 22.6                              | 37.6            | 7.6                     |
| Female                             | 66.6                        | 27.8                              | 35.1            | 35.3                    |
| Race/ethnicity                     |                             |                                   |                 |                         |
| Asian/Pacific Islander             | 45.9                        | 6.6                               | 22.9            | 11.5                    |
| Black                              | 217.9                       | 40.8                              | 35.4            | 17.1                    |
| Hispanic                           | 73.7                        | 18.2                              | 37.0            | 23.7                    |
| White                              | 42.8                        | 24.4                              | 34.0            | 19.9                    |
| Other                              | 379.5                       | 87.2                              | 186.9           | 102.4                   |
| Community-level income             |                             |                                   |                 |                         |
| Quartile 1 (lowest)                | 136.5                       | 34.1                              | 44.4            | 29.0                    |
| Quartile 2                         | 70.9                        | 25.3                              | 34.6            | 21.3                    |
| Quartile 3                         | 63.2                        | 23.7                              | 34.1            | 18.4                    |
| Quartile 4 (highest)               | 51.7                        | 17.5                              | 31.1            | 14.8                    |
| Location of patient's residence    |                             |                                   |                 |                         |
| Large central metropolitan         | 122.4                       | 26.5                              | 41.5            | 20.0                    |
| Large fringe metropolitan          | 71.8                        | 23.3                              | 37.8            | 20.3                    |
| Medium metropolitan                | 67.1                        | 27.3                              | 33.8            | 21.5                    |
| Small metropolitan                 | 52.6                        | 23.2                              | 29.2            | 20.8                    |
| Micropolitan area                  | 49.3                        | 22.1                              | 29.8            | 24.9                    |
| Noncore rural area                 | 45.9                        | 26.2                              | 31.3            | 25.0                    |
| Hospital region                    |                             |                                   |                 |                         |
| Northeast                          | 136.2                       | 21.7                              | 54.0            | 24.3                    |
| Midwest                            | 74.6                        | 27.7                              | 33.9            | 21.0                    |
| South                              | 73.8                        | 27.4                              | 34.0            | 22.5                    |
| West                               | 65.0                        | 21.7                              | 30.8            | 17.0                    |

Abbreviation: n/a, not available

Notes: Rates are adjusted for age and sex. Consistent with the Agency for Healthcare Research and Quality (AHRQ) Pediatric Quality Indicators (PDIs), obstetric stays are excluded.

<sup>a</sup> Consistent with the AHRQ PDIs, the age range varies across conditions. Asthma rates include patients aged 2–17 years; diabetes short-term complication rates include patients aged 6–17 years, and both gastroenteritis and urinary tract infection rates include patients aged 3 months–17 years.

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **Asthma was the most common reason for potentially preventable pediatric stays in 2017.**

Among patients aged 2–17 years, the rate of potentially preventable stays for asthma was 81.8 per 100,000 population. This rate was higher among males compared with females (96.3 vs. 66.6 per 100,000 population), higher among Black patients (217.9) compared with Hispanic, White, and Asian/Pacific Islander patients (range: 43–74 per 100,000 population), and higher among hospitals in the Northeast (136.2) compared with other regions (range: 65–75 per 100,000 population). This rate also decreased with community-level income and increased with urbanicity.

- **Rates of potentially preventable pediatric stays for asthma, gastroenteritis, and urinary tract infections were highest among children aged 0–4 years.**

Among the youngest pediatric age group (under age 5 years), rates of potentially preventable inpatient stays for asthma, gastroenteritis, and urinary tract infections were 159.1, 90.1, and 40.9 per 100,000 population, respectively.

Whereas the rate of potentially preventable pediatric stays for asthma decreased with age (dropping from 159.1 per 100,000 population among the youngest age group to 27.0 per 100,000 population among the oldest children), the rate for diabetes increased with age, increasing from 11.8 per 100,000 population among children aged 5–9 years to 37.7 per 100,000 population among children aged 15–17 years.

- **Rates of potentially preventable pediatric stays for diabetes, gastroenteritis, and urinary tract infections were lowest among Asian/Pacific Islander children.**

Compared with Black, Hispanic, and White children, Asian/Pacific Islander children had the lowest rate of preventable pediatric stays for diabetes short-term complications (6.6 vs. 18–41 per 100,000 population), gastroenteritis (22.9 vs. 34–37), and urinary tract infections (11.5 vs. 17–24).

Table 5 presents the total number of stays, aggregate costs, and mean cost per stay of potentially preventable inpatient stays among children for all conditions, chronic conditions, and acute conditions as well as for individual chronic and acute conditions in 2017.

**Table 5. Total stays, aggregate costs, and mean cost per stay for potentially preventable pediatric inpatient stays, 2017**

| Potentially preventable inpatient stays | Total stays, N | Aggregate costs, \$ millions | Mean cost per stay, \$ |
|---|----------------|------------------------------|------------------------|
| All conditions                          | 108,300        | 561.6                        | 5,200                  |
| Chronic conditions                      | 66,500         | 355.6                        | 5,400                  |
| Asthma                                  | 53,900         | 278.1                        | 5,200                  |
| Diabetes short-term complications       | 12,500         | 77.5                         | 6,200                  |
| Acute conditions                        | 41,800         | 206.0                        | 4,900                  |
| Gastroenteritis                         | 26,500         | 129.3                        | 4,900                  |
| Urinary tract infection                 | 15,400         | 76.7                         | 5,000                  |

Notes: Numbers of stays and mean costs are rounded to the nearest hundred. Number of stays and mean costs for all conditions, chronic conditions, and acute conditions are based on nonrounded totals. Consistent with PDIs, obstetric stays are excluded. To capture all potentially preventable stays, total counts and costs for chronic, acute, and all condition groups were computed as the sum of stays and costs for relevant individual conditions (instead of using the PDI composite measures, which are limited to patients aged 6–17 years).

Source: Agency for Healthcare Research and Quality (AHRQ), Healthcare Cost and Utilization Project (HCUP), State Inpatient Databases (SID) from 36 States, 2017, weighted to provide national estimates; AHRQ Quality Indicators, version 2019.01

- **Among potentially preventable pediatric inpatient stays, the highest aggregate hospital costs were associated with asthma, whereas the highest cost per stay was attributable to diabetes short-term complications.**

Hospital costs for potentially preventable pediatric stays for asthma totaled \$278.1 million in 2017. This was nearly equivalent to costs for gastroenteritis (\$129.3 million), urinary tract infections (\$76.7 million), and diabetes short-term complications (\$77.5 million) combined.

The average hospital cost per potentially preventable pediatric stay was higher for diabetes short-term complications (\$6,200) compared with stays for asthma, urinary tract infections, and gastroenteritis (range: \$4,900–\$5,200).

## About Statistical Briefs

Healthcare Cost and Utilization Project (HCUP) Statistical Briefs provide basic descriptive statistics on a variety of topics using HCUP administrative healthcare data. Topics include hospital inpatient, ambulatory surgery, and emergency department use and costs, quality of care, access to care, medical conditions, procedures, and patient populations, among other topics. The reports are intended to generate hypotheses that can be further explored in other research; the reports are not designed to answer in-depth research questions using multivariate methods.

## Data Source

The estimates in this Statistical Brief are based upon an analysis done for the National Healthcare Quality and Disparities Reports (QDR). For generating national Quality Indicator estimates, HCUP State Inpatient Databases (SID) were combined to create a nationally weighted analysis file because of variation in the availability of both race/ethnicity data and indicators of diagnoses being present on admission (POA), which are required for some of the AHRQ Quality Indicators. SID meeting the following inclusion criteria were included in the nationally weighted analysis file: (1) less than 10 percent of discharges failed edit checks on indicators of diagnoses being POA; (2) the SID included information on day of principal and secondary procedure; and (3) the SID included good reporting of race/ethnicity data. After hospitals and discharges that failed POA and race/ethnicity edits were excluded, the remaining discharges were weighted to represent all stays in the universe of community hospitals in the United States, excluding rehabilitation and long-term acute care facilities. In data year 2017, the nationally weighted analysis file includes data from 36 SID and 30,744,878 discharges (weighted, this represents 36,962,410 discharges). The District of Columbia and the following 35 States were included: Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Hawaii, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Virginia, and Washington.

## Definitions

### *Major diagnostic categories (MDCs)*

MDCs assign ICD-10-CM principal diagnosis codes to 1 of 25 general diagnosis categories. For this analysis, MDC 14 (Pregnancy, Childbirth, and Puerperium) was used to identify and exclude obstetric inpatient stays from the total nonobstetric stay counts and costs reported in Table 3.

### *Prevention Quality Indicators and Pediatric Quality Indicators*

The Prevention Quality Indicators (PQIs) and Pediatric Quality Indicators (PDIs, formerly known as PedQIs) are components of the AHRQ Quality Indicators (QIs). The QIs are a set of algorithms that may be applied to hospital administrative data to quantify quality issues among inpatient populations.

PQIs assess hospital admissions for 10 ambulatory care-sensitive conditions (ACSCs), that evidence suggests may be avoided, in part, through high-quality ambulatory care. These conditions are identified by principal diagnosis except for lower-extremity amputation among patients with diabetes. PQIs are adjusted for age and sex. Version 2019.01 of the PQI software also includes four composite measures assessing potentially avoidable hospitalizations overall and separately for chronic conditions, diabetes-specific conditions, and acute conditions.

PDIs focus on potentially preventable complications and iatrogenic events for pediatric patients treated in hospitals and on preventable hospitalizations among pediatric patients. This analysis focuses on the four area-level PDIs, which like the PQIs are measures of potentially avoidable hospitalizations for ACSCs. All of these conditions are identified by principal diagnosis. Although these measures rely on hospital discharge data, they are intended to reflect issues of access to, and quality of, ambulatory care in a given geographic area. PDIs are adjusted for age and sex. Version 2019.01 of the PQI software also includes three composite measures assessing hospitalizations overall and for chronic and acute conditions. Although the age ranges included in the denominator populations vary across the four area-level PDIs (2–17 years for asthma; 6–17 years for diabetes short-term complications, and 3 months–17 years for both

gastroenteritis and urinary tract infection), the PDI composites use a common age range (6 years to 17 years) for the denominator populations. Diverging from this approach, the chronic condition, acute condition, and all condition group totals reported in Table 5 of this Statistical Brief were computed as the sum of total stays or costs for individual conditions. These estimates are *not* limited to children aged 6 years or older.

Obstetric discharges are excluded from the potentially preventable discharges, defined by PQIs and PDIs, that are reported in this Statistical Brief. For all but one of the PQIs and PDIs, the AHRQ QI software identifies the ACSC using the principal diagnosis, thereby excluding obstetric discharges, which also are identified based on principal diagnosis. For lower-extremity amputation among patients with diabetes, the AHRQ QI software uses all-listed diagnoses to identify the ACSC; in this case, obstetric cases, as identified by principal diagnosis, are explicitly excluded.

Further information on the AHRQ QIs, including documentation and free software downloads, is available at [www.qualityindicators.ahrq.gov/](http://www.qualityindicators.ahrq.gov/). Additional information on how the QI software was applied to the HCUP data for the statistics reported in this Statistical Brief is available in Barrett et al., 2017.<sup>8</sup>

#### *Types of hospitals included in HCUP State Inpatient Databases*

This analysis used State Inpatient Databases (SID) limited to data from community hospitals, which are defined as short-term, non-Federal, general, and other hospitals, excluding hospital units of other institutions (e.g., prisons). Community hospitals include obstetrics and gynecology, otolaryngology, orthopedic, cancer, pediatric, public, and academic medical center hospitals. Excluded for this analysis are long-term care facilities such as rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals. However, if a patient received long-term care, rehabilitation, or treatment for a psychiatric or chemical dependency condition in a community hospital, the discharge record for that stay was included in the analysis.

#### *Unit of analysis*

The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in 1 year will be counted each time as a separate discharge from the hospital.

#### *Costs and charges*

Total hospital charges were converted to costs using HCUP Cost-to-Charge Ratios based on hospital accounting reports from the Centers for Medicare & Medicaid Services (CMS).<sup>9</sup> *Costs* reflect the actual expenses incurred in the production of hospital services, such as wages, supplies, and utility costs; *charges* represent the amount a hospital billed for the case. For each hospital, a hospital-wide cost-to-charge ratio is used. Hospital charges reflect the amount the hospital billed for the entire hospital stay and do not include professional (physician) fees. For the purposes of this Statistical Brief, costs are reported to the nearest hundred.

#### *How HCUP estimates of costs differ from National Health Expenditure Accounts*

There are a number of differences between the costs cited in this Statistical Brief and spending as measured in the National Health Expenditure Accounts (NHEA), which are produced annually by CMS.<sup>10</sup> The largest source of difference comes from the HCUP coverage of inpatient treatment only in contrast to the NHEA inclusion of outpatient costs associated with emergency departments and other hospital-based outpatient clinics and departments as well. The outpatient portion of hospitals' activities has been growing steadily and may exceed half of all hospital revenue in recent years. On the basis of the

---

<sup>8</sup> Barrett M, Coffey R, Houchens R, Heslin K, Moles E, Coenen N. Methods Applying AHRQ Quality Indicators to Healthcare Cost and Utilization Project (HCUP) Data for the 2017 National Healthcare Quality and Disparities Report (QDR). HCUP Methods Series Report #2018-01. May 11, 2018. U.S. Agency for Healthcare Research and Quality. <https://www.hcup-us.ahrq.gov/reports/methods/2018-01.pdf>. Accessed February 3, 2020.

<sup>9</sup> Agency for Healthcare Research and Quality. HCUP Cost-to-Charge Ratio (CCR) Files. Healthcare Cost and Utilization Project (HCUP). 2001–2017. Agency for Healthcare Research and Quality. Updated December 2019. [www.hcup-us.ahrq.gov/db/state/costtocharge.jsp](http://www.hcup-us.ahrq.gov/db/state/costtocharge.jsp). Accessed February 3, 2020.

<sup>10</sup> For additional information about the NHEA, see Centers for Medicare & Medicaid Services (CMS). National Health Expenditure Data. CMS website. Updated December 17, 2019. [www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=/NationalHealthExpendData/](http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/index.html?redirect=/NationalHealthExpendData/). Accessed February 3, 2020.

American Hospital Association Annual Survey, 2017 outpatient gross revenues (or charges) were about 49 percent of total hospital gross revenues.<sup>11</sup>

Smaller sources of differences come from the inclusion in the NHEA of hospitals that are excluded from HCUP. These include Federal hospitals (Department of Defense, Veterans Administration, Indian Health Services, and Department of Justice [prison] hospitals) as well as psychiatric, substance abuse, and long-term care hospitals. A third source of difference lies in the HCUP reliance on billed charges from hospitals to payers, adjusted to provide estimates of costs using hospital-wide cost-to-charge ratios, in contrast to the NHEA measurement of spending or revenue. HCUP costs estimate the amount of money required to produce hospital services, including expenses for wages, salaries, and benefits paid to staff as well as utilities, maintenance, and other similar expenses required to run a hospital. NHEA spending or revenue measures the amount of income received by the hospital for treatment and other services provided, including payments by insurers, patients, or government programs. The difference between revenues and costs includes profit for for-profit hospitals or surpluses for nonprofit hospitals.

#### *Location of patients' residence*

Place of residence is based on the urban-rural classification scheme for U.S. counties developed by the National Center for Health Statistics (NCHS) and based on the Office of Management and Budget (OMB) definition of a metropolitan service area as including a city and a population of at least 50,000 residents:

- Large Central Metropolitan: Counties in a metropolitan area with 1 million or more residents that satisfy at least one of the following criteria: (1) containing the entire population of the largest principal city of the metropolitan statistical area (MSA), (2) having their entire population contained within the largest principal city of the MSA, or (3) containing at least 250,000 residents of any principal city in the MSA
- Large Fringe Metropolitan: Counties in a metropolitan area with 1 million or more residents that do not qualify as large central metropolitan counties
- Medium Metropolitan: Counties in a metropolitan area of 250,000–999,999 residents
- Small Metropolitan: Counties in a metropolitan area of 50,000–249,999 residents
- Micropolitan: Counties in a nonmetropolitan area of 10,000–49,999 residents
- Noncore: Counties in a nonmetropolitan and nonmicropolitan area

#### *Community-level income*

Community-level income is based on the median household income of the patient's ZIP Code of residence. Quartiles are defined so that the total U.S. population is evenly distributed. Cut-offs for the quartiles are determined annually using ZIP Code demographic data obtained from Claritas, a vendor that produces population estimates and projections based on data from the U.S. Census Bureau.<sup>12</sup> The value ranges for the income quartiles vary by year. The income quartile is missing for patients who are homeless or foreign.

#### *Expected payer*

To make coding uniform across all HCUP data sources, the primary expected payer for the hospital stay combines detailed categories into general groups:

- Medicare: includes fee-for-service and managed care Medicare
- Medicaid: includes fee-for-service and managed care Medicaid
- Private insurance: includes commercial nongovernmental payers, regardless of the type of plan (e.g., private health maintenance organizations [HMOs], preferred provider organizations [PPOs])
- Self-pay/No charge: includes self-pay, no charge, charity, and no expected payment
- Other payers: includes other Federal and local government programs (e.g., TRICARE, CHAMPVA, Indian Health Service, Black Lung, Title V) and Workers' Compensation

<sup>11</sup> American Hospital Association. TrendWatch Chartbook, 2019. Table 4.2. Distribution of Inpatient vs. Outpatient Revenues, 1995–2017. [www.aha.org/system/files/media/file/2019/11/TrendwatchChartbook-2019-Appendices.pdf](http://www.aha.org/system/files/media/file/2019/11/TrendwatchChartbook-2019-Appendices.pdf). Accessed March 19, 2020.

<sup>12</sup> Claritas. Claritas Demographic Profile by ZIP Code. <https://claritas360.claritas.com/mybestsegments/>. Accessed February 3, 2020.

Hospital stays that were expected to be billed to the State Children's Health Insurance Program (SCHIP) are included under Medicaid.

For this Statistical Brief, when more than one payer is listed for a hospital discharge, the first-listed payer is used.

### *Region*

Region is one of the four regions defined by the U.S. Census Bureau:

- Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
- Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
- South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
- West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii

### *Reporting of race and ethnicity*

Data on Hispanic ethnicity are collected differently among the States and also can differ from the census methodology of collecting information on race (White, Black, Asian/Pacific Islander, American Indian/Alaska Native, Other [including mixed race]) separately from ethnicity (Hispanic, non-Hispanic). State data organizations often collect Hispanic ethnicity as one of several categories that include race. Therefore, for multistate analyses, HCUP creates the combined categorization of race and ethnicity for data from States that report ethnicity separately. When a State data organization collects Hispanic ethnicity separately from race, HCUP uses Hispanic ethnicity to override any other race category to create a Hispanic category for the uniformly coded race/ethnicity data element, while also retaining the original race and ethnicity data. This Statistical Brief reports race/ethnicity for the following categories: Hispanic, non-Hispanic White, non-Hispanic Black, Asian/Pacific Islander, and non-Hispanic Other.

### **About HCUP**

The Healthcare Cost and Utilization Project (HCUP, pronounced "H-Cup") is a family of healthcare databases and related software tools and products developed through a Federal-State-Industry partnership and sponsored by the Agency for Healthcare Research and Quality (AHRQ). HCUP databases bring together the data collection efforts of State data organizations, hospital associations, and private data organizations (HCUP Partners) and the Federal government to create a national information resource of encounter-level healthcare data. HCUP includes the largest collection of longitudinal hospital care data in the United States, with all-payer, encounter-level information beginning in 1988. These databases enable research on a broad range of health policy issues, including cost and quality of health services, medical practice patterns, access to healthcare programs, and outcomes of treatments at the national, State, and local market levels.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

**Alaska** Department of Health and Social Services  
**Alaska** State Hospital and Nursing Home Association  
**Arizona** Department of Health Services  
**Arkansas** Department of Health  
**California** Office of Statewide Health Planning and Development  
**Colorado** Hospital Association  
**Connecticut** Hospital Association  
**Delaware** Division of Public Health  
**District of Columbia** Hospital Association  
**Florida** Agency for Health Care Administration



**Georgia** Hospital Association  
University of **Hawaii**, Hilo, Center for Rural Health Science  
**Hawaii** Lailima Data Alliance  
**Illinois** Department of Public Health  
**Indiana** Hospital Association  
**Iowa** Hospital Association  
**Kansas** Hospital Association  
**Kentucky** Cabinet for Health and Family Services  
**Louisiana** Department of Health  
**Maine** Health Data Organization  
**Maryland** Health Services Cost Review Commission  
**Massachusetts** Center for Health Information and Analysis  
**Michigan** Health & Hospital Association  
**Minnesota** Hospital Association  
**Mississippi** State Department of Health  
**Missouri** Hospital Industry Data Institute  
**Montana** Hospital Association  
**Nebraska** Hospital Association  
**Nevada** Department of Health and Human Services  
**New Hampshire** Department of Health & Human Services  
**New Jersey** Department of Health  
**New Mexico** Department of Health  
**New York** State Department of Health  
**North Carolina** Department of Health and Human Services  
**North Dakota** (data provided by the Minnesota Hospital Association)  
**Ohio** Hospital Association  
**Oklahoma** State Department of Health  
**Oregon** Association of Hospitals and Health Systems  
**Oregon** Office of Health Analytics  
**Pennsylvania** Health Care Cost Containment Council  
**Rhode Island** Department of Health  
**South Carolina** Revenue and Fiscal Affairs Office  
**South Dakota** Association of Healthcare Organizations  
**Tennessee** Hospital Association  
**Texas** Department of State Health Services  
**Utah** Department of Health  
**Vermont** Association of Hospitals and Health Systems  
**Virginia** Health Information  
**Washington** State Department of Health  
**West Virginia** Department of Health and Human Resources, West Virginia Health Care Authority  
**Wisconsin** Department of Health Services  
**Wyoming** Hospital Association

## About the SID

The HCUP State Inpatient Databases (SID) are hospital inpatient databases from data organizations participating in HCUP. The SID contain the universe of the inpatient discharge abstracts in the participating HCUP States, translated into a uniform format to facilitate multistate comparisons and analyses. Together, the SID encompass more than 95 percent of all U.S. community hospital discharges. The SID can be used to investigate questions unique to one State, to compare data from two or more States, to conduct market-area variation analyses, and to identify State-specific trends in inpatient care utilization, access, charges, and outcomes.

## About the QDR

The *National Healthcare Quality and Disparities Report* (QDR) measures and tracks trends in quality and disparities in seven key areas of healthcare: patient safety, person-centered care, care coordination,

effective treatment, healthy living, care affordability, and access to healthcare. The QDR is an annual report that was commissioned by Congress in 1999 and first published in 2003. Beginning with the 2014 report, findings that previously appeared in two separate reports (the *National Healthcare Quality Report* and the *National Healthcare Disparities Report*) have been integrated into a single document that provides a comprehensive overview of the quality of healthcare received by the general population and disparities in care experienced by different racial, ethnic, and socioeconomic groups. Information on individual measures will be available through chartbooks, which will be posted monthly. The QDR is designed and produced by AHRQ, with support from the Department of Health and Human Services (HHS) and private sector partners.

## For More Information

For other information on preventable hospitalizations, refer to the HCUP Statistical Briefs located at [www.hcup-us.ahrq.gov/reports/statbriefs/sb\\_preventable.jsp](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb_preventable.jsp).

For additional HCUP statistics, visit:

- HCUP Fast Stats at [www.hcup-us.ahrq.gov/faststats/landing.jsp](http://www.hcup-us.ahrq.gov/faststats/landing.jsp) for easy access to the latest HCUP-based statistics for healthcare information topics
- HCUPnet, HCUP's interactive query system, at [www.hcupnet.ahrq.gov/](http://www.hcupnet.ahrq.gov/)

For more information about HCUP, visit [www.hcup-us.ahrq.gov/](http://www.hcup-us.ahrq.gov/).

For a detailed description of HCUP and more information on the design of the State Inpatient Databases (SID), please refer to the following database documentation:

Agency for Healthcare Research and Quality. Overview of the State Inpatient Databases (SID). Healthcare Cost and Utilization Project (HCUP). Rockville, MD: Agency for Healthcare Research and Quality. Updated November 2019. [www.hcup-us.ahrq.gov/sidoverview.jsp](http://www.hcup-us.ahrq.gov/sidoverview.jsp). Accessed February 3, 2020.

## Suggested Citation

McDermott KW (IBM Watson Health), Jiang HJ (AHRQ). Characteristics and Costs of Potentially Preventable Inpatient Stays, 2017. HCUP Statistical Brief #259. June 2020. Agency for Healthcare Research and Quality, Rockville, MD. [www.hcup-us.ahrq.gov/reports/statbriefs/sb259-Potentially-Preventable-Hospitalizations-2017.pdf](http://www.hcup-us.ahrq.gov/reports/statbriefs/sb259-Potentially-Preventable-Hospitalizations-2017.pdf).

## Acknowledgments

The authors would like to acknowledge the contributions of Marguerite Barrett of M.L. Barrett, Inc. and Tim Kenney of Kenney IS Consulting, Inc.

\* \* \*

AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of healthcare in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at [hcup@ahrq.gov](mailto:hcup@ahrq.gov) or send a letter to the address below:

Joel W. Cohen, Ph.D., Director  
Center for Financing, Access and Cost Trends  
Agency for Healthcare Research and Quality  
5600 Fishers Lane  
Rockville, MD 20857

This Statistical Brief was posted online on June 16, 2020.